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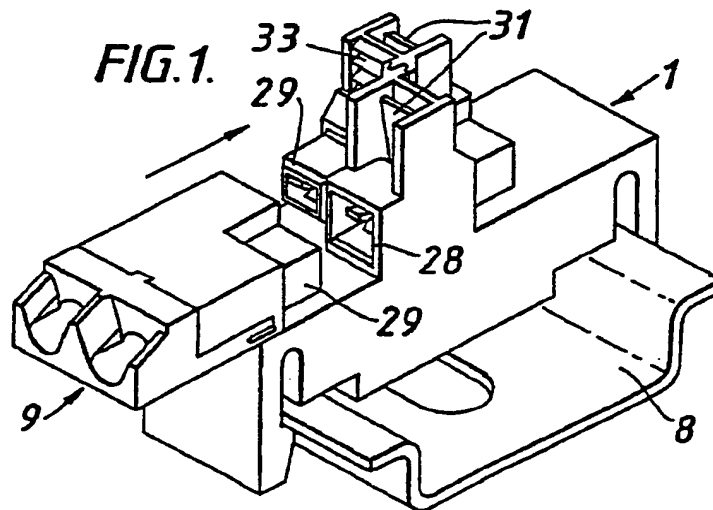
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WPI

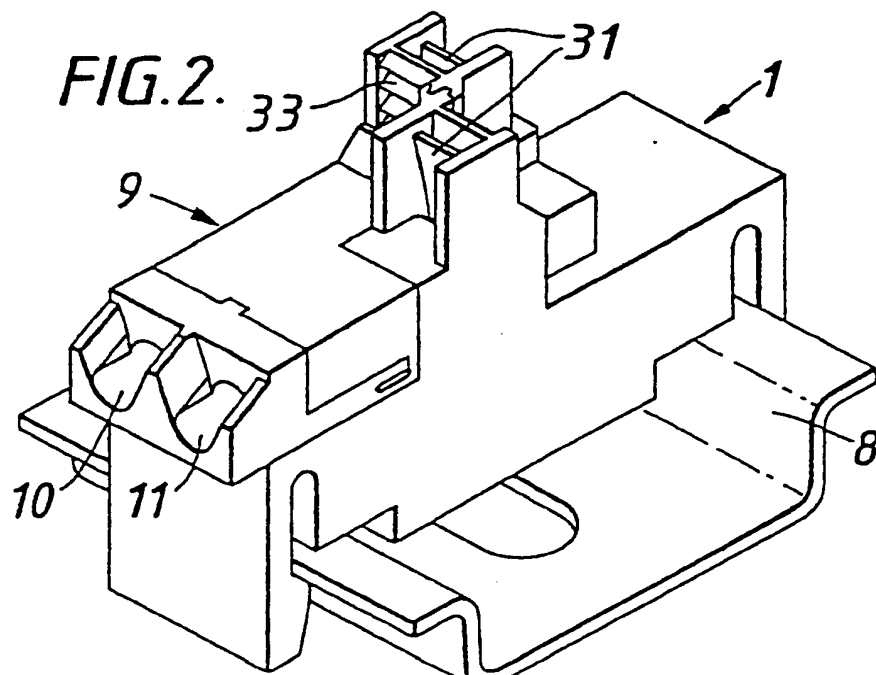
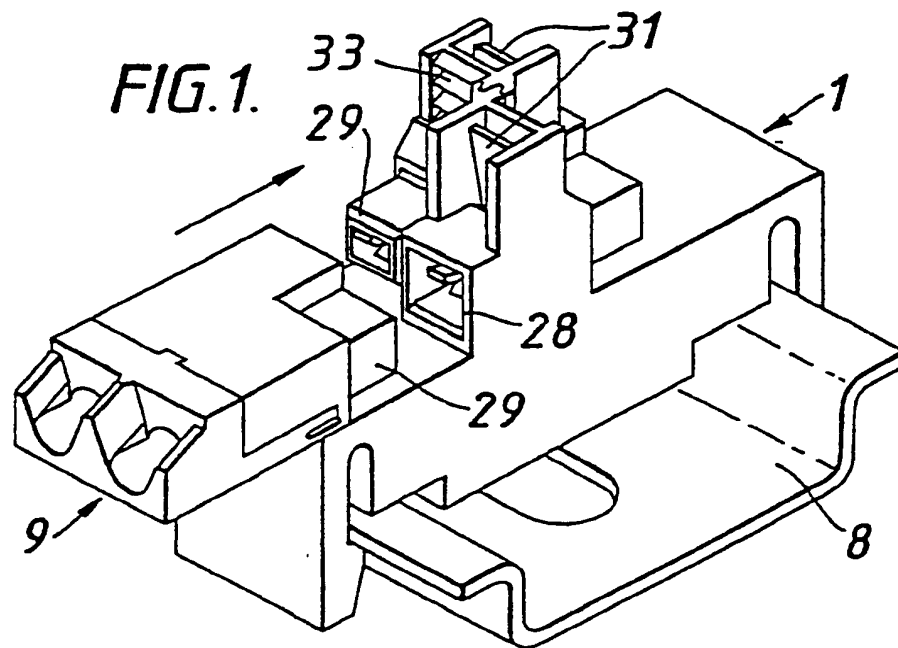
## (54) Transmission line connectors and assemblies thereof

(57) A transmission wire or line connector sub-assembly capable of installation with one or more other such sub-assemblies as a modular connector assembly, comprises a connector unit (1) provided on opposite sides with pairs of ports (28, 29) interconnected by means of intermediate contact members; and two connector blocks (9), each carrying a pair of primary contacts arranged at one end to disconnectably engage the intermediate contacts at each of the connector unit ports, and at another end to receive exchange/subscriber transmission lines and electrically connect these to said primary contacts, whereby, on engagement of the connector blocks with the connection unit ports, to make electrical connection with the intermediate contacts. A test contact access point is provided between interconnected ports and comprises a pivotable lever (31) held in testing position by a crocodile clip engaging a serrated surface (33).



The date of filing shown above is that provisionally accorded to the application in accordance with the provisions of Section 15(4) of the Patents Act 1977 and is subject to ratification or amendment.

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FIG. 3.

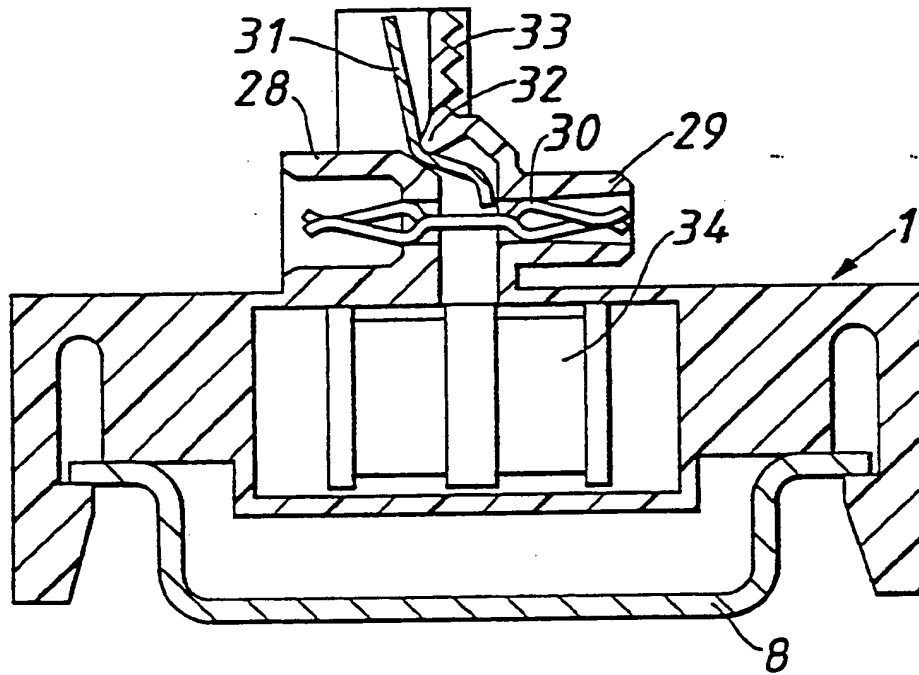
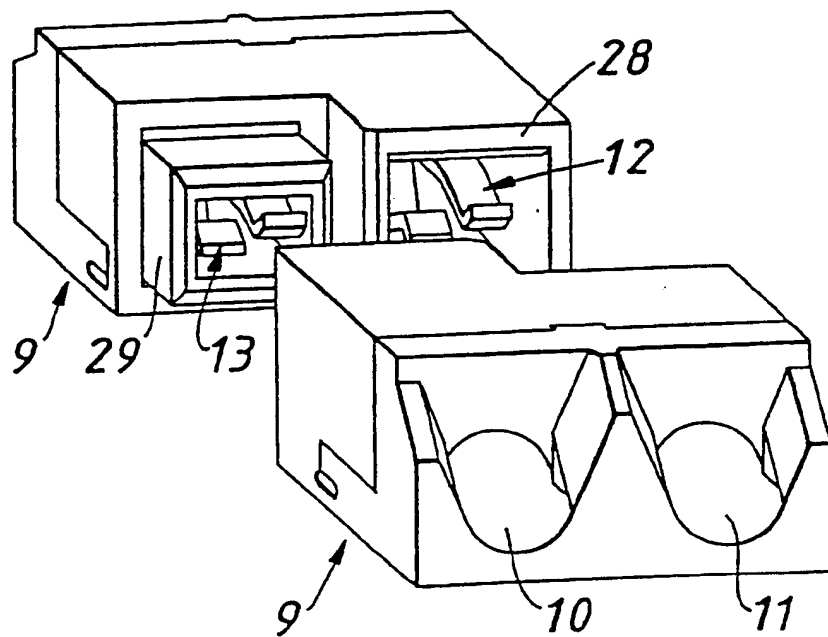


FIG. 4.



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FIG. 5.

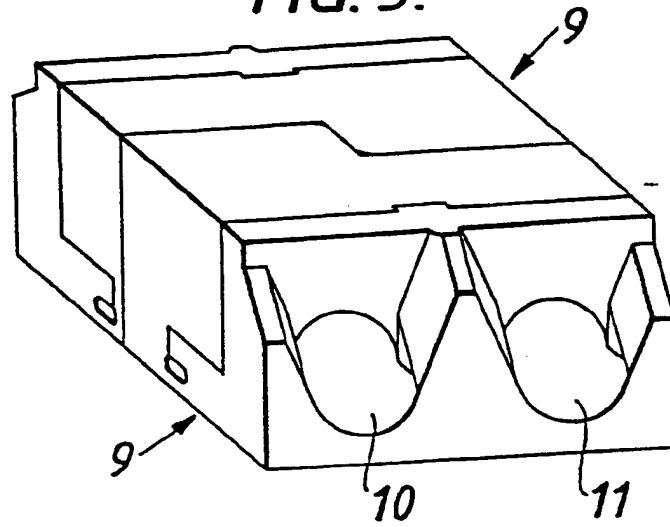


FIG. 6.

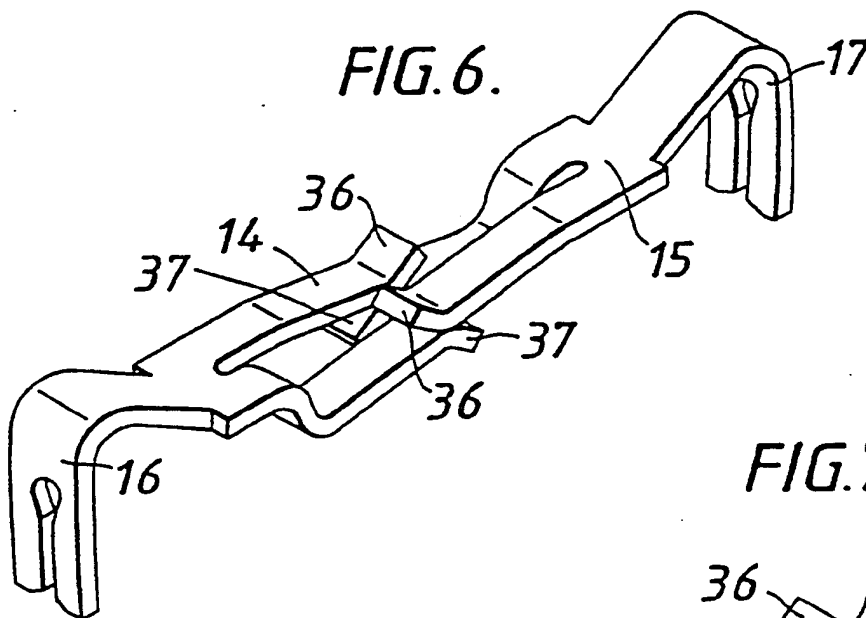
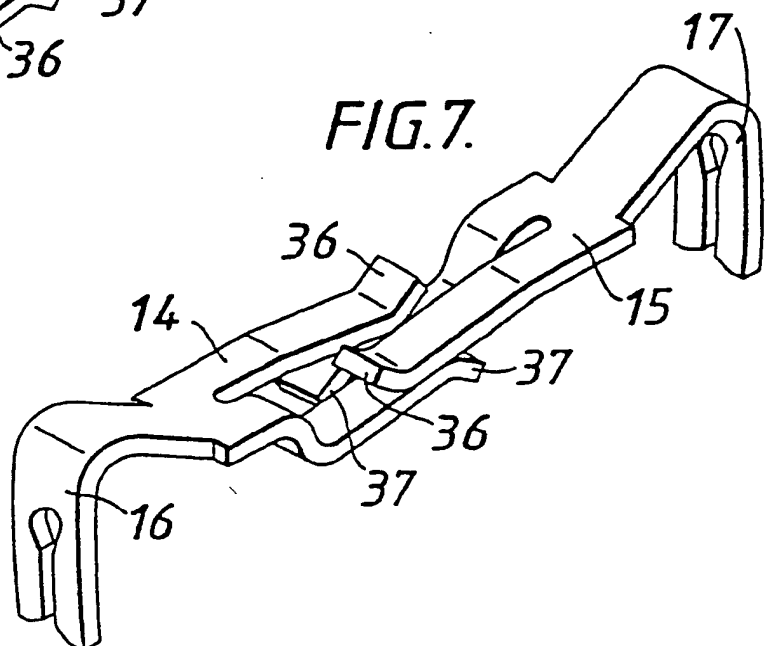


FIG. 7.



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FIG. 8.

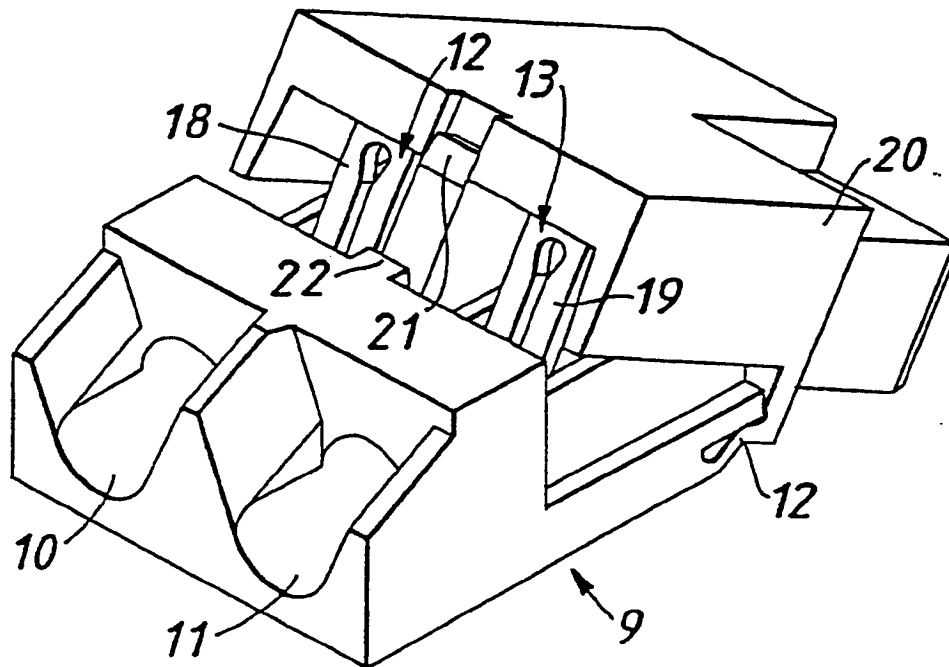


FIG. 9(a)

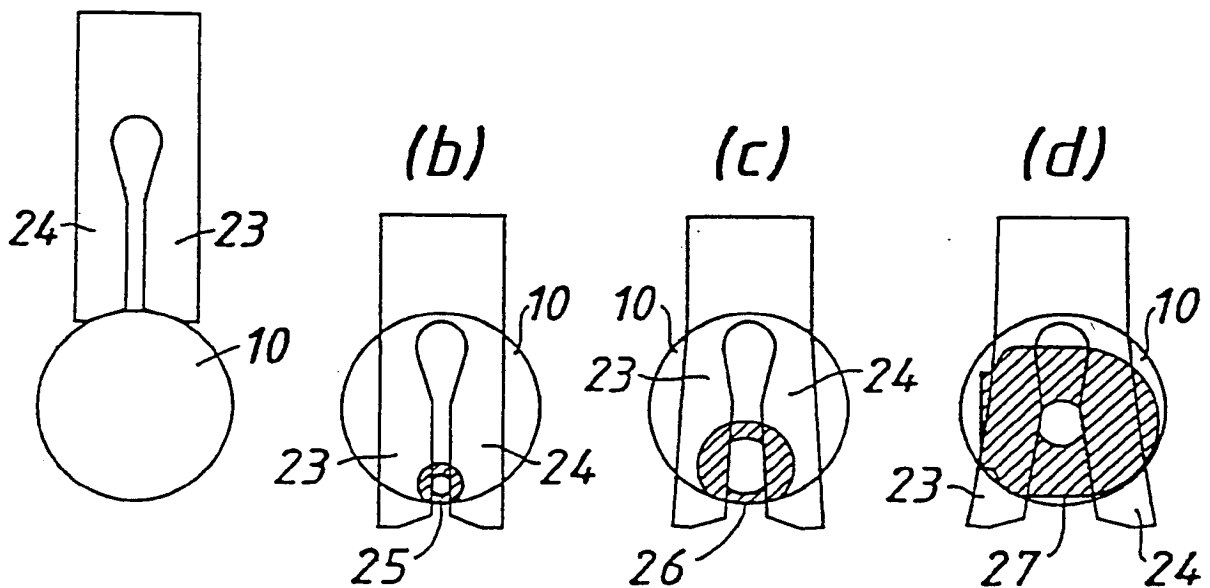
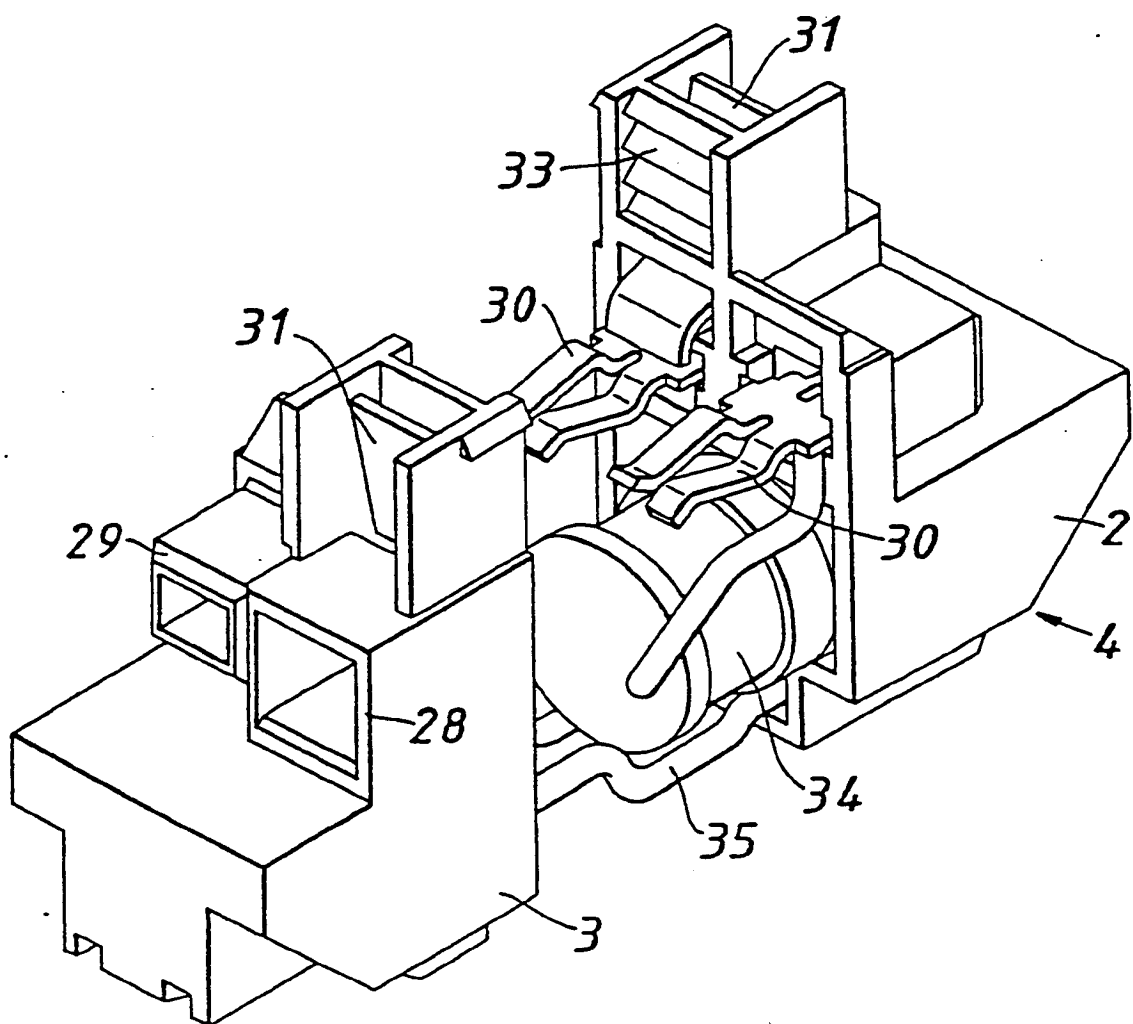
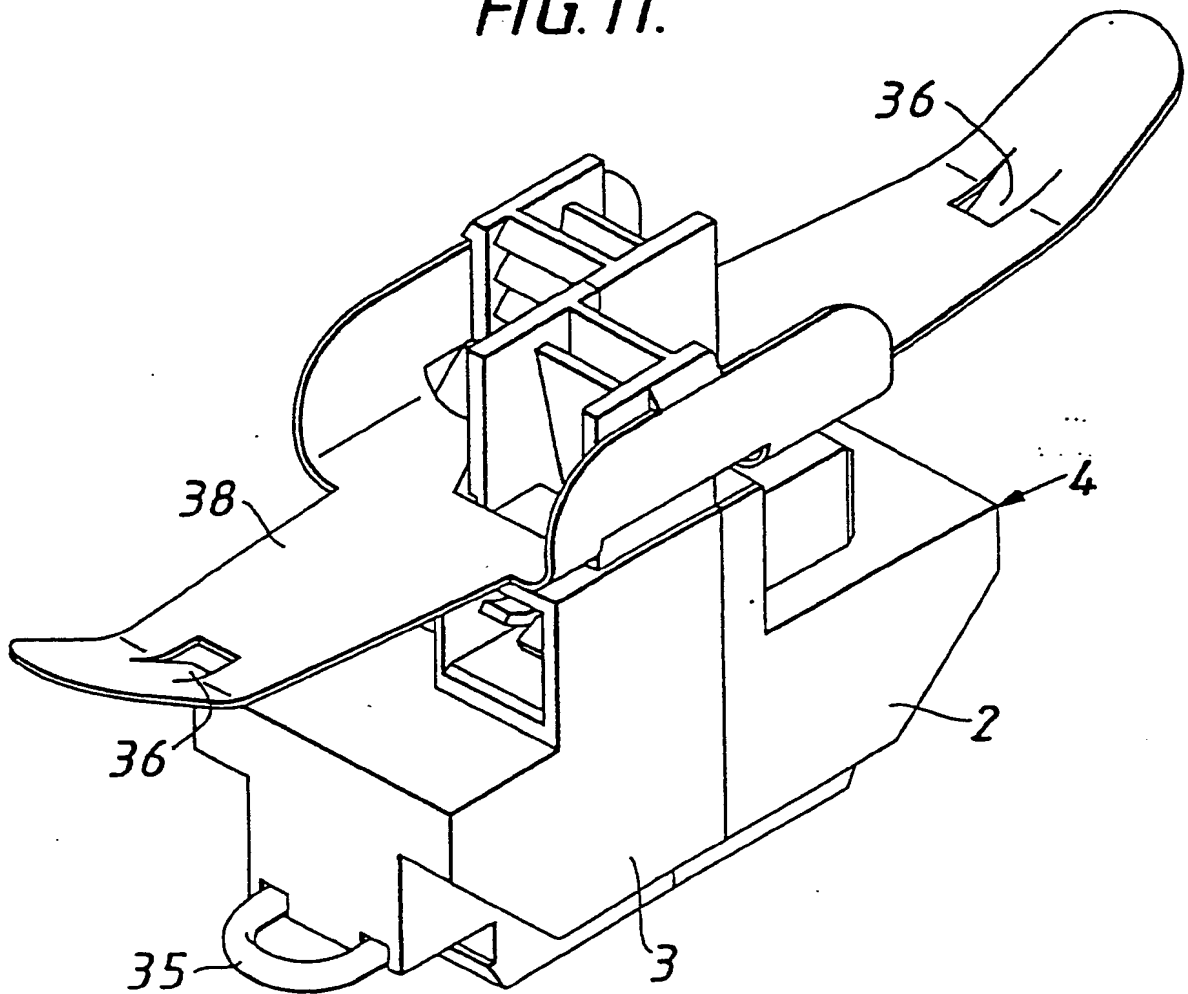


FIG. 10.



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FIG. 11.



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FIG. 12.

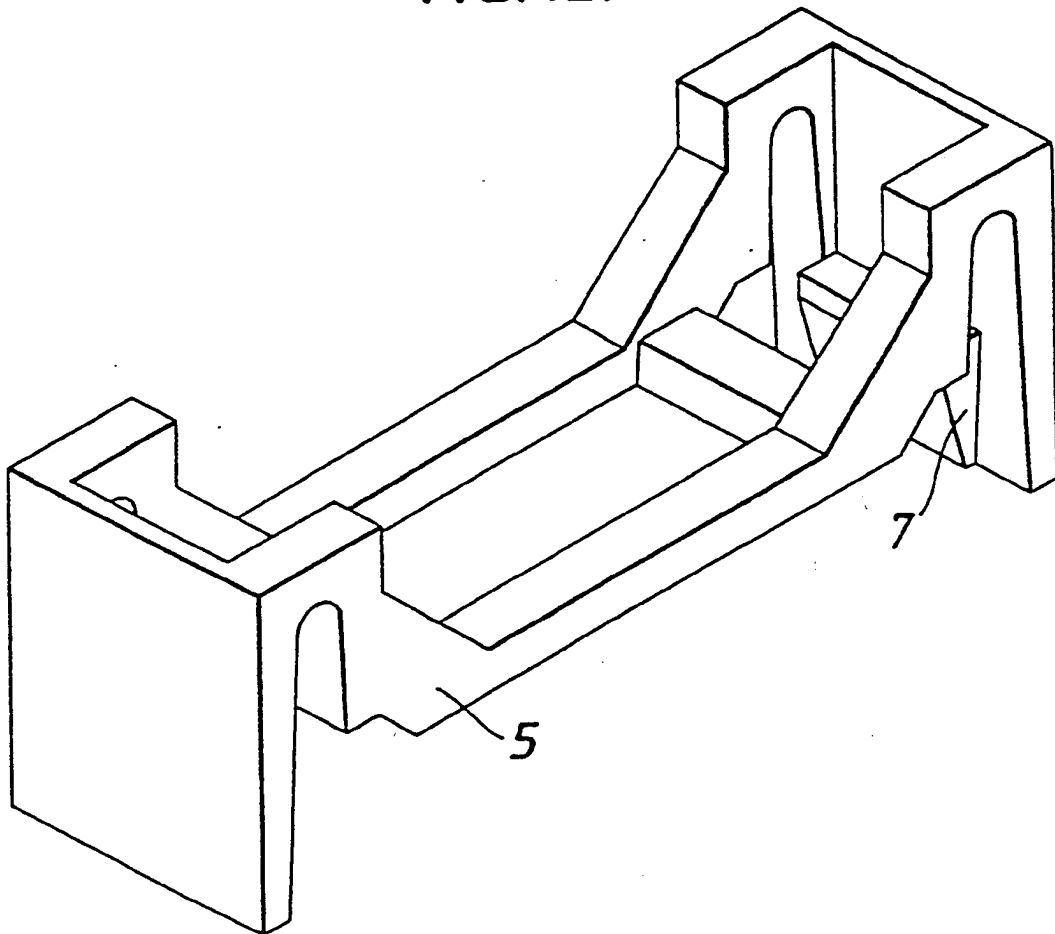
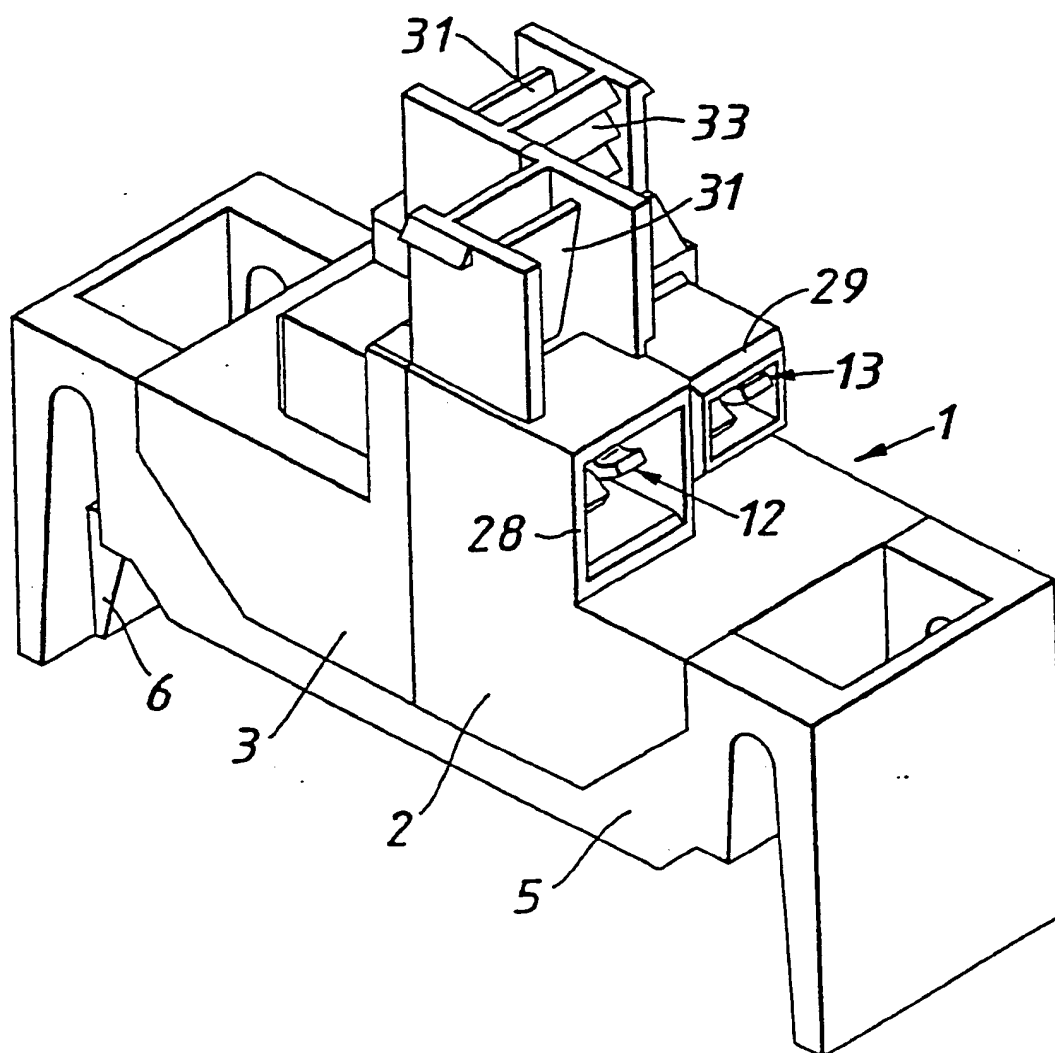




FIG. 13.



TRANSMISSION LINE CONNECTORS AND ASSEMBLIES THEREOF

This invention relates to transmission wire or line connectors and assemblies thereof, and more particularly, although not exclusively, to connector assemblies for linking telecommunication lines together, particularly lines from a telecommunications exchange to lines leading to subscribers to the telecommunications system.

It is known to provide such assemblies in which a plurality of contacts having line insulation penetration clips are connected at one end to lines from a telecommunications exchange. Lines leading to the telecommunications subscribers are then connected, either directly or indirectly, to the other end of the contacts.

Hitherto it has been common for such assemblies to comprise a complete fabrication capable of connecting a multiplicity of lines from the exchange, to a multiplicity of subscriber lines. Such an arrangement lacks flexibility of usage in relation to the number of lines to be connected at any particular point of installation. Again, commonly the connection of the exchange lines into the assembly is at a different position, and by a different mechanism, to the connection of subscribers lines. Thus, it is common for the multiplicity of exchange lines to be connected firstly into the assembly, usually on one side of the assembly, and often all at the same time and in a semi-permanent fashion, whereafter subscriber lines are connected individually and separately as required on another side of the assembly, often by a different mechanism, to contacts linking with the appropriate exchange lines. Again, such an arrangement is of limited flexibility of usage in the field.

It is an object of the present invention to provide transmission line connectors and assemblies thereof arranged for simple, flexible, and effective usage by operatives in the field.

In accordance with the present invention there is provided a transmission wire or line connector sub-assembly capable of installation with one or more other such sub-assemblies as a modular connector assembly, in which the connector sub-assembly comprises a connector unit provided with four ports arranged in two pairs of

associated ports, the members of each pair being disposed on opposite sides of the unit and interconnected by means of an intermediate contact member; and two connector blocks, each carrying a pair of primary contacts, said primary contacts being arranged at a connector block port end thereof to each disconnectably engage the intermediate contact of a connector unit port, and at another end being arranged to receive an exchange or a subscriber transmission line and electrically connect the same to said primary contact, whereby, on engagement of the connector block port with a connection unit port, to make electrical connection with the intermediate contact therein, the sub-assembly being provided with a test contact access point between the or each two interconnected ports.

By means of the invention two connector blocks, for example, carrying and connecting to transmission lines from the exchange and from a subscriber respectively can be linked disconnectably through the ports in the connector unit and the intermediate contact passing therebetween. It will be appreciated that this enables easy connection and disconnection between the exchange line and the subscriber line giving considerable ease of operation and testing, and that the connector unit, acting as a module, can be assembled with a plurality of the same to provide a total assembly appropriate for the number of lines to be interconnected.

The test contact access point provided between the two interconnected ports allows the electrical state and

condition of the intermediate contact passing between the ports to be tested, without any significant disturbance of the intermediate contact.

Preferably, the assembly includes a test contact normally lying out of contact with the intermediate contact member but capable of being brought into such contact. This further allows the intermediate contact member to remain sealed yet testable without expanding live electrical conductors.

A particularly preferred arrangement is for the test contact to be associated with an upstanding wall and to be capable of being brought into contact with the intermediate contact member by being urged toward the wall, for example by a crocodile clip attached over the wall and test contact. This latter possibility is aided by a surface of the wall distant from the test contact being corrugated.

The interconnecting ports of the connector unit are disposed on opposed sides of the unit, so that connector blocks can methodically be connected in association with such ports on one side or the other depending, for example, upon whether they are exchange or subscriber lines.

The connector unit may incorporate a plurality of said two interconnecting ports, and in line with normal customary practice of a telecommunications system, may include a pair of such two interconnecting ports so that a pair of subscriber lines can be connected to a pair of exchange lines.

Means may be provided for holding in place in a locked

fashion each connector block to the connector unit.

The connector blocks may be so shaped and dimensioned that in addition to being capable of connection with ports on either side of the connector body unit, they are equally capable of direct interconnection together whereby the wiring of a testing device inserted into a wire inlet or inlets of a connector block and connected therein to the primary contact passing therethrough, can be connected for testing direct to a subscriber or exchange transmission line.

The intermediate contacts between two interconnecting ports may be double ended with male/female parts at each end, and similarly the primary contacts within the connector blocks will, at their ports connectable to the ports of the connector unit, have complementary female/male parts whereby any two contacts associated with any two interconnectable ports will be capable of firm engagement between the respective male/female parts.

Conveniently, the connector block units, acting as modules of an assembly, are interconnected by mounting on an appropriate rail or similar body which may be arranged to be disposed in a suitable box.

It is to be understood that the invention includes within its scope an assembly of a plurality of connector units as hereinbefore described.

In order that the invention may be more readily understood one embodiment thereof will now be described by way of example with reference to the accompanying drawings

in which:-

Figure 1 illustrates in isometric view a connector unit in accordance with the invention to which a connector block is about to be connected, the connector unit being mounted on an assembly support rail;

Figure 2 shows the arrangement of Figure 1 with the connector block having made contact with the connector unit;

Figure 3 is a section of the connector unit of Figure 1;

Figure 4 illustrates isometrically two connector blocks adjacent one another;

Figure 5 shows the connector blocks of Figure 4 connected together;

Figures 6 and 7 illustrate isometrically the contact making arrangement between male and female parts of two primary contacts;

Figure 8 illustrates isometrically a connector block opened for receipt of transmission lines;

Figures 9 (a) (b) (c) (d) illustrate schematically the method of acceptance and connection between a transmission line and the relevant bifurcation of a primary contact;

Figure 10 is an isometric view of the two part body of the connector unit separated to show internal features;

Figure 11 illustrates isometrically the body of the connector unit carrying a clip member for locating in position the connector blocks;

Figure 12 shows isometrically the carriage of the

connector unit body which is arranged for connection to the support rail; and

Figure 13 shows the body of Figure 11 mounted on the carriage of Figure 12.

Referring now to the drawings it will be seen that a connector unit 1 of plastics material is formed from two identical halves 2,3 (Figures 10, 11 and 13) of a connector body 4, and a carriage 5 therefor. The two half bodies 2,3 are held together, after installation of the appropriate equipment therein, by means of positive location upon the carriage 5. The carriage in turn is provided with snap wedges 6,7 for location under the rim of a metal support rail 8 running the length of a plastics box (not shown) upon which rail 8 a plurality of connector units 1 may be assembled side by side to provide a modular connector assembly of any required length. Typically, each connector unit 1 has a width across the rail of the order of 45 mm and a length along the rail of the order of 12 mm. The box and its accompanying rail may be so dimensioned as to enable the accommodation of up to thirty connector units.

Associated with the connector unit are plastics connector blocks 9, and each connector block carries a pair of line inlet ports 10,11 arranged to receive either a pair of exchange lines or a pair of subscriber lines (not shown). Their insertion can be best understood from Figure 8. Figure 8 shows a connector block 9 opened about a hinge portion 12 to enable the insertion of transmission lines through its ports 10,11. As can be seen the connector



block carries primary metal contacts 12,13 of the kind shown in Figures 6, and 7, the forward end 14,15 projecting towards the connecting bores, and the trailing end 16,17 depending ready for contact with the incoming exchange or subscriber line.

In operation with the connector block 9 in the disposition shown in Figure 8, the transmission lines are passed through the opening ports 10,11 so as to lie beneath the trailing ends 18,19 of the contacts. The contact sub-block 20 is now closed and locked by means of a central resilient catch 21,22, this closing action operating the bifurcated depending portions 23,24 of the contacts as best illustrated in Figures 9 (a) (b) (c) and (d) to cut through the insulation of the transmission line and make good firm contact with the metal of the line.

It is to be appreciated from Figures 9 (a) (b) (c) and (d) that the forked nature of the contact and its stiff resilience, enables it satisfactorily not only to make good electrical contact with the exchange line conductor 25 shown in Figure 9 (a), but also with significantly different diameter subscriber lines 26,27 (known as drop wires) as illustrated in Figures (c) and (d).

It will be observed that the connector blocks connection ports are of a spigot and socket nature, in that one of the pair of ports 28 of each such connector block is of a greater internal diameter and carries with it the appropriately located male/female parts of the primary contact 12, whilst the other connector port 29 is of a

lesser diameter carrying complementary female/male parts of its primary contact and is therefore capable of insertion in the juxtaposed socket either of the connector unit 1, or of a second connector block, whilst the larger dimensioned connector bore is capable of receiving the equivalent smaller dimensioned spigot either of the connector unit or the second connector block. It is to be noted that by the alternate arrangement on each side of the connector unit of spigot and socket ports, any connector block can be connected on either side of the connector unit. Similarly, any connector can be connected to any other connector, and by this means it is possible, for example, after having linked in the leads of testing equipment into a first connector block, to connect that first connector block to a second connector block already connected to a transmission line, be it exchange or subscriber, for testing purposes.

Figures 3 and 10 illustrate the internal layout of equipment within the connector unit body. As can be seen best from the cross section of Figure 3, a socket 28 on one side of the unit is interconnected to a spigot 29 on the other side by means of a metallic double ended intermediate contact 30. Located above the intermediate contact is an integral unit including a metallic test contact 31 pivotable about a shoulder 32, normally lying out of contact with the intermediate contact member, but capable upon a crocodile clip (not shown) engaging a corrugated upstanding wall 33 and the test contact 31, of being

brought into electrical contact with the intermediate contact 30 so that testing thereof and the lines connected to it can be carried out without any significant disturbance of the intermediate contact.

It is to be noted that, if required, a gas discharge tube or surge arrester 34 can be disposed in contact with the intermediate contact 30 and mounted in the body therebelow. The gas discharge tube 34 is also connected by means of wiring 35 shown in Figures 10 and 11, to the metal support rail to provide an earth contact for the tube. The gas discharge tube is a protective device and serves, when used, to absorb surges in electrical power, such as may be caused by lightning, and thereby prevent damage to telecommunication equipment.

The male/female portions of the contacts, and their manner of intercommunication can be seen from Figures 6 and 7. It will be seen that the leading part 14,15 of each contact is in the form of a fork, the left hand one of which (looking forward) has at its end an up-turn 36, and the right hand one of which has at its end a down-turn 37. Interengagement between facing contacts is therefore always satisfactorily accomplished. Figure 6 shows two contacts just after interengagement, whilst Figure 7 shows those same contacts fully interengaged for good electrical communication therebetween.

In normal operation a connector block carrying a pair of exchange lines is connected into one side a connection unit, and a block carrying a pair of subscriber lines is

connected into the other side for interlinking therebetween. The blocks may be positively locked in place by engagement with downturned pressed tubes 36 from an overlying metal plate 37.

It is to be understood that the foregoing is merely exemplary of transmission wire connectors in accordance with the invention and that modifications can readily be made thereto without departing from the true scope of the invention.

Reference is made to our co-pending application No: 9124355.0 published as GB 2261773 from which this application has been derived. GB 2261773 describes and claims matter also described in the present application.

## CLAIMS

1. A transmission wire or line connector sub-assembly capable of installation with one or more other such sub-assemblies as a modular connector assembly, in which the connector sub-assembly comprises a connector unit provided with four ports arranged in two pairs of associated ports, the members of each pair being disposed on opposite sides of the unit and interconnected by means of an intermediate contact member; and two connector blocks, each carrying a pair of primary contacts, said primary contacts being arranged at a connector block port end thereof to each disconnectably engage the intermediate contact of a connector unit port, and at another end being arranged to receive an exchange or a subscriber transmission line and electrically connect the same to said primary contact, whereby, on engagement of the connector block port with a connection unit port, to make electrical connection with the intermediate contact therein, the sub-assembly being provided with a test contact access point between the or each two interconnected ports.
2. A sub-assembly according to claim 1 including a test contact normally lying out of contact with the intermediate contact member but capable of being brought into such contact.

3. A sub-assembly according to claim 2 wherein the test contact is associated with an upstanding wall and is capable of being brought into contact with the intermediate contact member by being urged toward the wall.
4. A sub-assembly according to claim 3 wherein a surface of the wall distant from the test contact is corrugated.
5. A sub-assembly as claimed in any one of the preceding claims wherein the ports on the other side of the unit are of a reversed nature to the ports on said one side whereby any connector block is connectable on either side of the unit.
6. A sub-assembly as claimed in any one of the preceding claims incorporating a plurality of said two interconnecting ports.
7. A sub-assembly as claimed in any one of the preceding claims including means for holding in place in a locked manner each connector block to the connector unit.
8. A sub-assembly as claimed in any one of the preceding claims arranged for mounting on linking means for interconnection into an assembly of a plurality of

units.

9. A transmission wire or line connector sub-assembly substantially as shown in and as hereinbefore described with reference to the accompanying drawings.
10. A sub-assembly as claimed in any one of the preceding claims wherein the intermediate contacts between the or each tow interconnecting ports are double ended with male and female contact parts at each end, and the primary contacts within the connector blocks have, at their ports connectable to the ports of the connector unit, complementary female and male connector parts whereby any two contacts associated with any two interconnectable ports will be capable of firm engagement between the respective male and female parts.
11. A sub-assembly as claimed in any one of the preceding claims arranged for mounting on linking means for interconnection into an assembly of a plurality of units.
12. An assembly of a plurality of connector sub-assemblies, each sub-assembly being as claimed in any one of the preceding claims.

<b>Patents Act 1977</b> <b>Examiner's report to the Comptroller under Section 17</b> <b>(The Search report)</b>		<b>Application number</b> <b>GB 9508455.4</b>
<b>Relevant Technical Fields</b>  (i) UK Cl (C.I.N)      H2E: ECBF ECHU ECSJ EDCU ECBA ECAAX ECAK ECAF ECX EX EPAX ECSH  (ii) Int Cl (Ed.6)      H01R H04M		<b>Search Examiner</b> <b>MRS J BANNISTER</b>
<b>Databases (see below)</b> (i) UK Patent Office collections of GB, EP, WO and US patent specifications.  (ii) WPI		<b>Date of completion of Search</b> <b>20 JUNE 1995</b>  <b>Documents considered relevant following a search in respect of Claims :-</b> <b>ALL</b>

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<b>A:</b>	Document indicating technological background and/or state of the art.	<b>&amp;:</b>	Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
A	GB 2260036 A	(A C EGERTON)	
A	GB 1584638	(GLYBEN)	
A	US 4925393	(INDEP. TECHNOLOGIES)	

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